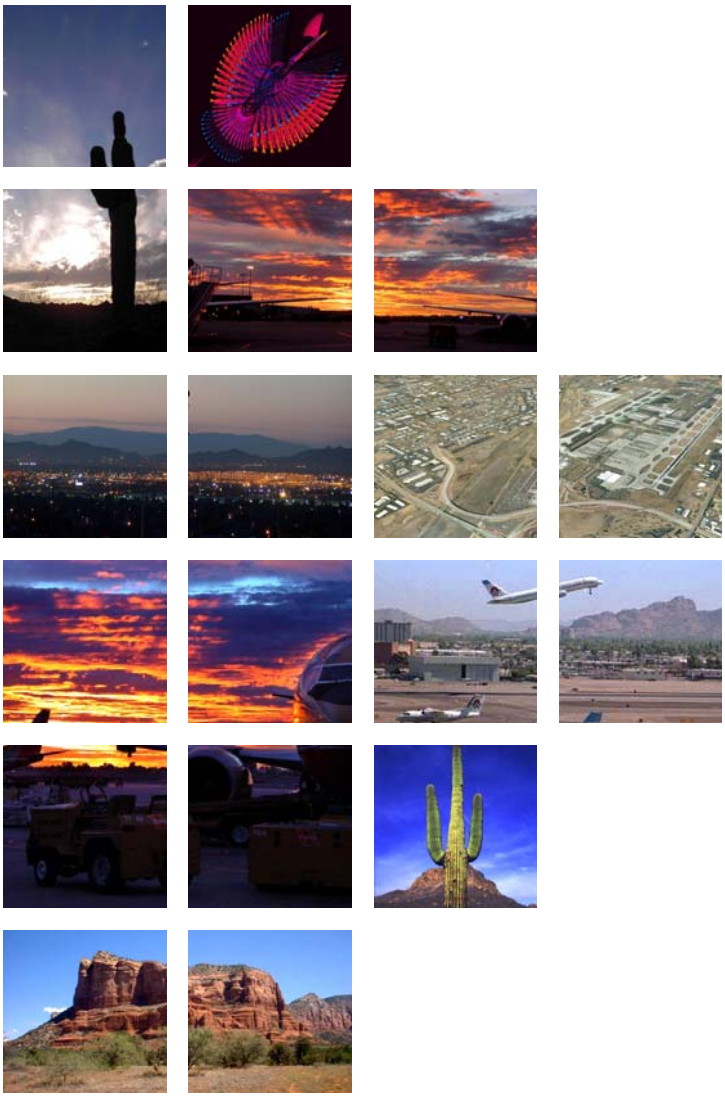

Section 9

Potential Liabilities

Section 9 Potential Liabilities

There are many liabilities related to the operation, construction and use of any ARFF training facility. Since the FAA has been providing grant funding for these facilities for more than two decades, there is some concrete information that is now known concerning the liabilities related to these facilities. There have been more then twenty five facilities built within the continental United States in this time frame, funded in full, or part, through the FAA grant fund process.

The 1995 ADOT Greiner report contained a valuable matrix of potential liabilities related to the operation and construction of a regional training facility. This matrix still has considerable merit today and was reviewed for this section.

9.1 Technology

Fire fighters need to have an opportunity to develop their skills through extensive training. This training needs to be of the magnitude, scope and proportion to the aircraft size or index of the airport. With the large amount of fuel carried by some aircraft (as much as 25,000 to 50,000 gallons), fuel spills can develop as large as 150 feet. Thus, the fire training facility should be capable of reproducing this threat which will allow multiple vehicles and operators to coordinate and practice their firefighting strategies and tactics.

Large ARFF propane training facilitates have been in use for over two decades. Today the largest number of training facilities built for aviation firefighting and structural firefighting training are constructed using propane liquefied gas as the preferred fuel.

The FAA Advisory Circulars 150/5220-17A and 17A1, *Design Standards for an Aircraft Rescue and Firefighting Training Facility* and *CHANGE 1 to Design Standards for an Aircraft Rescue and Firefighting Training* were developed to help designers configure both hydrocarbon and liquid propane facilities. Propane is used for interior fire fighting due to safety concerns would be much more difficult to develop an interior trainer using hydrocarbon fuels.

When the construction of these facilities takes place, particular care must be taken to assure that ground water contamination does not take place in the course of conducting firefighting training classes. This requires that heavy duty vapor barriers or liners be deployed within the training facility areas to assure that extinguishing agent or water dispensed from rescue vehicles in training does not leach into under ground water aquifers. These facilities usually contain ground water sampling monitoring wells to periodically test the ground water for contamination of agent and the fuels used.

Propane facilities generally include both a large pool fire called a fuel spill area as well as a Specialized Aircraft Fire Simulator. This second simulator will provide for specialized fires such as wheel well and brake fires, engine nacelle fires, auxiliary power unit (APU) fires, and interior aircraft fires. The large spill fire facility is generally set up in segments or sections and can be controlled in such a manner as to allow smaller fires or fully contain pit fires around the fuselage mockup.

These pool fire facilities require a degree of continual maintenance, perhaps on a weekly basis, based on how often the facility is used. This requires a crew of dedicated, well trained individuals who have both maintenance and computer skills. In addition they should have extensive experience in ARFF so they can run scenarios and recognize training trends conducted on the fire grounds.

The large pool fire pit contains thermocouple sensors placed in segments around the fuselage mockup. The pit itself is constructed of a fire resistant concrete berm or curbing. This material will brake down over time due to the high radiant heat and the application of water and extinguishing agent utilized within the training evolutions. The sensing elements within the pit are covered with a grade of "blue rock" or high heat resistant stone. Due to the application of high flow turret applications of water onto the surface, stone will be thrown or moved around on the sensing surface ground. Maintenance personnel must carry on a continual program of re-spreading or redistributing this "blue rock" to protect the propane feed lines and thermocouple sensors just under the surface of the rock.

The facility must be fully protected from lightning discharge and lightning strikes. Provisions must be provided to protect the ground base thermocouple sensors and computer feedback boards from ground voltage discharge buildup. Standard procedures should be to disconnect or isolate the ground sensors from the control room computer systems to assure that voltage buildup under high lightning conditions in not fed back to the computer control system. Failure to accomplish this can result in thousands of dollars of damage to the sensitive thermocouple sensing systems.

9.2 Maintenance Requirements

Each specialized fire simulation station must be exercised to assure its safe operation prior to conducting training classes. Prior to conducting classes, all dead man switches need to be exercised to assure safe operation. This is required prior to every class.

A propane storage farm or storage tank facility is required to provide the high quantities of propane fuel utilized for a typical training class. This requires the maintenance of distribution valves, pumps and sensors. The storage area needs to be fenced, locked, and secured from unauthorized personnel.

Water should be collected, cleansed, and recycled for reuse in training evolutions. This requires a pumping station a holding pond and a large amount of water. EPA inspections of the holding pond water quality are to be expected.

9.3 Economics

It is expensive to provide training for each fire fighter with full pit involvement. The specialized aircraft fire simulator was developed to provide scenario based training evolutions. This aids in reducing the high cost of providing valuable training. These specialized fires such as a wheel and brake fire utilize about 1/20 the amount of propane fuel for a three minute burn compared to the large fuel spill fire.

Providing training to other organizations involves classrooms, showers and specialized equipment that cannot be readily carried on an aircraft, such as fire ensembles and SCBA gear. Providing this equipment imposes a requirement for cleaning, inspection and damage replacement of this very costly gear. It is recommended that this firefighting gear be stored in a secure area and a system of accountability be set up to assure the return of the facility's equipment.

Fully involved pit fires with extinguishment utilizing major ARFF vehicles require knowledgeable instructors skilled in tactics and strategies in using these vehicles. Provisions should be made for backup instructors.

Major ARFF vehicles are expensive to purchase and costly to operate. In the case of facilities with single ARFF trucks, provisions should be made for a backup vehicle. Facilities with multiple ARFF vehicles should have a plan to adjust teaching and training schedules should a vehicle be down for maintenance.

9.4 Safety

ARFF propane fire training facilities have an excellent safety record over the last two decades. Built according to the FAA Advisory Circular 150/5220-17A *Design Standards for an Aircraft Rescue and Firefighting Training Facility* has assured that these facilities have met the environmental challenges associated with fuel fire training and yet provided safe quality realistic training.

The liability is very high when trying to conduct realistic large fires as well as hand line events having students with unknown skills and experience levels. Basic first aid kits should be readily available and instructors should be familiarized with training safeguards. Procedures should be in place for calling for outside medical services if needed. Having emergency medical technicians on site is the optimum situation for all training scenarios. Heat exhaustion is a common occurrence due to the high, radiant heat of the trainers. The physical endurance of the training evolutions and having to wear thermo, insulated aluminized fire suits adds to the problem. Allowing students to utilize their own gear requires pre-inspection and determinations to assure that their gear meets minimal fire standards and is in good operational condition.

National Fire Protection Association (NFPA) Standards related to training educators' professional qualifications, firefighter training requirements, and airport emergency services standards should be adopted and adhered to. The scope and depth of this information is extensive. A new training facility administration should adhere to these industry consensus standards and seek training instructors who have an extensive background in applying the elements of the various standards. Running an emergency services training facility is difficult and requires adherence to safe Standard Operating Procedures (SOPs) and industry best practices. A facility needs to provide a safe, quality training experience to its students if it desires to be competitive in the ARFF training market.

Insurance underwriters and risk organizations that provide liability insurance for airports look closely at airport organizations to see that the emergency services plan follows national and international consensus standards and best practices. Insurance underwriters would look closely at any training facility to assure that their Standard Operating Procedures (SOPs) closely follow the guidelines of NFPA training and emergency services standards for airports as well as structural fire fighting.

9.5 Environmental

The proper permits for emitting ground water discharge and air quality discharge should be documented and licensed prior to conducting any training. These permits should be on display at the facility administration office. Current aviation firefighting facilities generally contain both large pit fire training capabilities as well as an assortment of smaller training fires. Environmental air and water quality regulations are getting more and more stringent. Changes to the regulations are making it difficult for aircraft rescue and firefighting (ARFF) personnel to get quality firefighting training. Fire fighters need both truck fire responses to a large pool spill fire as well as exposure to fires which may include an interior fire, cargo fire, brake and wheel well fire, engine fire both under the wing, and tail mounted engine nacelle fires, auxiliary power unit (APU) fire, electrical box or circuit breaker based fire, cockpit fire, and galley fire.

When construction of these facilities takes place, particular care must be taken to assure that ground water contamination does not take place in the course of conducting firefighting training classes. This requires that heavy duty vapor barriers or liners be deployed within the training facility areas to assure that extinguishing agents dispensed from rescue vehicles in training doesn't leach into under ground water aquifers. These facilities usually contain ground water sampling monitoring wells to periodically test the ground water for contamination of agent and the fuels used. Major rescue vehicles used today can throw extinguishing agent over 200 feet. This means that a large area well beyond the fire pits circumference must also be within the protected spill area.

Alternative hydrocarbon fuels should not be utilized at a propane facility unless provisions are made to properly collect and remove residual unburned hydrocarbons. The proper permits for emitting ground water discharge and air quality discharge utilizing hydrocarbon fuels would be required.

The following pages contain a matrix of issues related to the operation and liability of a typical ARFF propane training facility.

PROPANE TRAINER				
FAA Requirements	**Technology**	**Economic**	**Safety**	**Environmental**
Must meet FAA Part 139, live fire training.	ARFF Trainers have been available and in use for two decades.	Most costly training system when computer feedback controls are utilized.	Fairly safe to operate. Requires specializes training.	Lowest environmental impact.
Must be sized to meet airport index.	Requires fire ground feedback sensors to measure agent application rate.	Cost of propane fuel varies from state to state.	Requires specializes training.	Reduced smoke emitted from site location.
Requires large pool fire training exercise every other each year.	Capable of providing small or partial pit fires as well as large pool fires.	Smaller fire size controls fuel cost. Reduces propane usage.	It's safer for fire fighter when conducting hand line event to reduce fire size.	Smaller controlled fires reduce impact of smoke from facility. Community awareness.
Allows, alternative training to include engine, cabin fire, nacelle fires, and APU fires every other year.	May include both large pit fire and interior mockup with specialized response fires.	Smaller specialized fires can reduce cost to conduct class and still meet FAA training requirements.	Smaller fires allow close up work with hose lines.	Hose line application reduced water consumption needed for training.
FAA will fund both a large pool fire trainer.	FAA requires automatic safety controls. Provides dark smoke output at ground level. Fire fighters view	Full pit fires are most costly form of training.	Instructors have safety shutdown or kill switches to over ride system.	Creates clean fires which can be controlled through water application. Smoke usually dissipates before leaving training area
FAA will also fund a specialized aircraft fire simulator with assorted fires.	Provides alternative fire scenarios. Does not require the use of foams. Simulated or surrogate foams available	Reduces propane usage, thus reduces cost for class. Water only application reduces training cost. Use of surrogate foams adds to cost.	Fires are activated by onsite instructors. Thermocouple sensors measure temperature reduction from water application, reduce propane gas output. Have shown to have no fire fighter impact.	Reduced smoke output and water consumption. Reduces propane discharge over rate and application of time. Can be handled in normal waste water treatment system.

Propane Operational Trainer	Technology	Economic	Safety	Environmental
Large pool fire.	Requires computer operator in control room or control station.	Overseas site operation and computer equipment.	Should have two individual in control station.	Should have elevated view, capable of seeing all fire operations.
	Requires radio communications with control station.	Requires several trained and dedicate individuals.	Safety director on fire grounds.	Safety director should be suited and prepare to intervene should the need arise.
	Truck application requires major ARFF vehicle	Costly, can not be taken from daily operational fleet.	Requires driver training, a standard operation procedures.	Should provide both day and night training.
	Teaches procedures and techniques.	Expensive. Requires large amount of water.	Radiant heat is very high. Requires fire fighters to be suited up properly.	Requires aluminized fire suits and SCBA.
Multiple trucks.	Pool fire is large enough that a coordinated response can be accomplished with multiple trucks.	Vehicle utilization is expensive, high maintenance cost. Should have dedicated vehicles	Require degree of driver formulization with equipment.	
Large pool fire/hand line events.	Capable of providing realistic smaller hand line fire fighting scenarios.	Reduces cost, develops teamwork.	Requires on ground safety officer and instructors. Generally accepted (NFPA) Two instructors for every 6 students.	Instructors need to be suited and in control of class at all times.
Specialized trainer, specialized fires.	Provides realistic training. Hand line coordination. Team applications Interior fire simulation possible.	Lower cost. Allows for more than one training event at the same time. High level of realism. Reduced cost and fuel consumption	Requires hand line hose line as well as backup safety line. Requires backup safety crew with backup safety line. Interior fires requires mandatory NFPA compliant second water safety source	Fire fighters must wear SCBA. Conducted within confines of the specialized interior fire trainer. Requires non-toxic simulated smoke.

PROPANE TRAINER				
Liabilities	**Technology**	**Economic**	**Safety**	**Environmental**
ARFF propane gas trainers.	Used for two decades.	Costly to construct.	Have good safety record.	Generally accepted at airport communities.
Manual propane controls.	Used by USAF.	Not as costly to construct.	Instructors control gas fire output and extinguishment. Lack safety backups.	Usually involves smaller systems not built to FAA index training standards.
Computer control propane trainers.	FAA requires water application feedback sensing controls and rate of extinguishment. Computer generated training records.	Requires trained individual to run and maintain system.	Has computer based safety backups as well as instructor dead man controls.	Fits in well within the airport community.
Large pool fire.	Requires continual ground maintenance of pool fire stone bed.	Requires degree of weekly maintenance.	Requires on field instructors as well as safety and computer control operators.	Smoke generally does not carry from airport property.
Computer sensors and controls.	Thermocouples sense temperature rate of drop over time.	Requires constant calibration and checkouts.	Requires trained dedicate crew to maintain system.	
System fuselage mockups.	Must be cooled to prevent warping and heat damage.	Finite life time between 10 and 20 years.	Mock-up as well as support structure. Must withstand years of high radiation heat fires.	Must be fully safety grounded.
Controls and valves.	Must use NFPA approved control systems and valves. National Propane Industry Standards.	All piping and controls should be corrosive resistant.	Requires daily and weekly maintenance operations.	
Fire Grounds	Shall be suitably protected from truck discharges.	Should have subsurface liners and grade stone for vehicle operation areas.	Training area should be lighted, fenced and secured.	Normal traffic should be unable to gain access to training site area.
Water	Recycle of water or drain pit collection should be considered.	High water consumption operations anticipated.		Water only will aid in recycling of training water.
Alternative extinguishing agents.	Dry Chemical and other extinguishing agents use should be restricted unless special provisions for collection and removal are provided.	Use of other than water on site for extinguishing adds to and complicates cost of the facility.	Risk of contamination is very high.	Ground water contamination in containment area possible.